REMARKS/ARGUMENTS

Claims 1-21 and 23-34 are pending. Claims 1, 21 and 23 have been amended. Claim 22 has been canceled. New claims 27-34 have been added.

Claims 1, 3-10 and 14-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hirai and Kirin. Applicant respectfully traverses the rejection.

Claim 1 is directed to forming a non-volatile memory device. The claim recites "providing a substrate; forming an oxide layer overlying the substrate, the oxide layer having an amorphous surface structure; forming a buffer layer on the amorphous oxide layer after forming the oxide layer over the substrate; thermally annealing the buffer layer to enhance an alignment of crystallites of the buffer layer; forming a ferroelectric material overlying the substrate; forming a gate layer overlying the ferroelectric material, the gate layer overlying a channel region; and forming a first source/drain region adjacent to a first side of the channel region and a second source/drain region adjacent to a second side of the channel region."

The claimed embodiment relates to forming a buffer layer on the oxide layer that has been formed on the substrate. That is, a silicon oxide layer is formed on silicon surface using a thermal oxidation process without any prior deposited material on the silicon surface. An oriented, insulating buffer layer is formed on an amorphous silicon-oxide layer, rather than on silicon surface that has a crystalline structure. This process is based on the inventor's discovery that a certain insulating material (such as MgO) can be grown self-oriented on amorphous surface (such as silicon oxide) under certain process conditions, contrary to the general belief by those skilled in the art. The above process enables a silicon oxide layer to be formed directly on a silicon surface, so that high-quality passivation of silicon surface may be obtained.

However in Hirai et al., an oriented buffer layer is first formed on crystalline silicon surface and then a silicon oxide layer is formed sandwiched in between the silicon and insulating buffer by annealing them in oxygen ambient. A silicon oxide resulting from the Hirai process is generally of lower quality than the silicon oxide formed directly on the silicon surface. Hirai discloses the above method resulting in low quality oxide presumably because the inventors of Hirai, like others, did not know how to form an oriented buffer layer on a non-

crystalline surface. Kirin does not remedy the deficiency of Hirai. Therefore, claim 1 is allowable.

Claim 21 recites, "providing a semiconductor substrate; forming a gate oxide layer on the substrate, the oxide layer having a non-crystalline structure; forming a MgO layer overlying the oxide layer after forming the oxide layer on the substrate; thermally annealing the second buffer layer to enhance an alignment of crystallites of the second buffer layer; forming a ferroelectric material overlying the substrate; forming a gate layer overlying the ferroelectric material, the gate layer overlying a channel region; and forming first and second doped regions adjacent to first and second ends of the channel region." Neither Hirai nor Kirin, alone or in combination, disclose or teach the above recited features. Therefore, claim 21 is allowable.

Claim 26 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hirai, Kirin, and Wolf. Applicants respectfully traverse the rejection. Claim 26 depends from claim 21 and is allowable at least for this reason.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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